



Iowa Department of Transportation

DEVELOPMENTAL SPECIFICATIONS FOR FULL DEPTH RECLAMATION

Effective Date
April 15, 2003

THE STANDARD SPECIFICATIONS, SERIES 2001, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

01023.01 DESCRIPTION.

This work consists of reclaiming the existing asphalt pavement to the width and depth specified in the contract documents, mixing the reclaimed material in-place with an asphalt stabilizing agent, additional materials (when specified), and water (if required), and compacting this mixture.

01023.02 MATERIALS.

A. Asphalt Stabilizing Agent.

Unless otherwise specified in the contract documents, the asphalt stabilizing agent may, at the Contractor's option, be either of the following:

1. Emulsified Asphalt (HFMS-2s) meeting the requirements of Section 4140 of the Standard Specifications.
2. Foamed Asphalt using PG 52-34 asphalt binder meeting the requirements of Section 4137 of the Standard Specifications.

Unless otherwise stated in the contract documents, the residual asphalt **application** rate of 3.0%, by dry mass, shall be used to determine the estimated plan quantity of asphalt stabilizing agent.

B. Pulverized Bituminous Material.

The reclaimed paving material shall conform to the following gradation. **The gradation may be revised with the approval of the Engineer, but the top size of the material shall not exceed 25% of the depth of the compacted recycled mat.**

<u>Sieve Size</u>	<u>% Passing</u>
1 1/2 inch (37.5 mm)	98 to 100
1 inch (25 mm)	90 to 100

The gradation may be revised with the approval of the Engineer, but the top size of the material shall not exceed 25% of the depth of the compacted recycled mat.

C. Mineral Stabilizing Agents.

A mineral stabilizing agent may be required by the mix design. When specified, the agent may be from any locally available commercial source meeting the following criteria.

1. Portland cement shall meet ASTM Type I.
2. Flyash may come from any available source.
3. Hydrated lime shall meet the requirements of Article 4193.
4. Limestone fines shall come from limestone crushing operations.

C.D. Mix Design

The contract documents will specify the mix design for the stabilized reclaimed mixture. The mix design establishes the depth of milling, the amount of added material, and the amount of residual asphalt to incorporate into the milled material and the optimum laboratory compaction moisture. The Contractor shall determine the amount of additional water required to achieve optimum moisture for compaction.

01023.03 CONSTRUCTION.

The Contractor shall perform full depth reclamation between April 1 and November 1 unless otherwise specified in the contract documents.

The Contractor shall not perform recycling reclaiming operations when the any of the following conditions exist: ambient temperature is below 50°F (10°C); weather is rainy; or weather conditions are such that proper mixing, shaping, and compacting the recycling reclaiming material cannot be accomplished.

A. Equipment.

The Contractor shall furnish a self-propelled machine capable of reclaiming the existing paving material to the width and depth shown in the contract documents. The machine shall be equipped with automatic depth control and maintain a constant cutting depth and width. It shall also be capable of pulverizing bituminous material to the required gradation. The equipment shall be capable of mixing the reclaimed material and asphalt stabilizing agent into a homogeneous mixture. The equipment shall provide a positive means for accurately controlling the rate of flow and total delivery of the asphalt stabilizing agent into the mixture in relation to the speed and quantity of material being recycled. The delivery system shall meet the requirements of Article 2001.22, F, of the Standard Specifications.

When foamed asphalt is used, the asphalt foaming system shall accurately and uniformly add the specified percent of water to the hot asphalt binder. The equipment shall be fitted with a test nozzle to provide field samples of foamed asphalt. Tankers supplying the hot asphalt binder shall be equipped with a thermometer to continuously measure the temperature of the asphalt in the bottom third of the tank.

The rollers for compacting the reclaimed material shall meet the requirements of Article 2001.05 of the Standard Specifications. The Contractor shall have, as a minimum, the following rollers for use: a sheepfoot roller, a double drum steel roller, and a 25 ton (22.5 Mg) or greater pneumatic tire roller. The steel drum roller may be used in the static or vibratory mode.

A. B. Preparation.

Prior to initiating the recycling reclaiming operation, the Contractor shall clear all vegetation and debris within the width of pavement to be reclaimed. Removal of this vegetation and debris from the project shall be in accordance to Article 1104.08 of the Standard Specifications.

B. C. Reclaiming the Existing Pavement.

The Contractor shall furnish a self-propelled machine capable of reclaiming the existing paving material to the width and depth shown in the contract documents. The machine shall be equipped with automatic depth control and maintain a constant cutting depth and width. It shall also be capable of pulverizing bituminous material processed to the required gradation.

The equipment shall be capable of mixing the reclaimed material and asphalt stabilizing agent into a homogeneous mixture. The equipment shall provide a positive means for accurately controlling the rate of flow and total delivery of the asphalt stabilizing agent into the mixture in relation to the speed and quantity of material being recycled. The delivery system shall meet the requirements of Article 2001.22, F of the Standard Specifications. During recycling reclaiming operations, the Contractor shall apply the asphalt stabilizing agent to the pulverized material at a rate that will achieve the residual asphalt content established by the mix design. The Engineer may vary the application rate of asphalt stabilizing agent as required by existing pavement conditions.

The Contractor may add water to the pulverized material shall determine the amount of additional water needed to facilitate uniform mixing with the asphalt stabilizing agent and achieve a stable reclaimed layer above the minimum specified density. The water may be added prior to or concurrently with the asphalt stabilizing agent. Adding water to facilitate uniform mixing shall not adversely affect the asphalt stabilizing agent.

The mineral stabilizing agent may be added dry or in slurry form.

When foamed asphalt is used, only equipment that initiates foaming at the spray nozzle will be permitted. The equipment shall be fitted with a test nozzle to provide field samples of foamed asphalt. Tankers supplying the hot asphalt binder shall be equipped with a thermometer to continuously measure the temperature of the asphalt in the tank.

If multiple passes of the equipment are required to reclaim the pavement material to the desired width, a minimum 6 inch (150 mm) overlap shall be used. The asphalt stabilizer application system shall be capable of adjusting for the width of recycling reclaiming such that overlapped mixture maintains the designed residual asphalt content.

C. D. Compaction and Density Shaping.

The field density for the reclaimed mat on Interstate and Primary roads shall be a minimum of 94% of laboratory density based on the dry weight of compacted material in accordance with Materials I.M. 504. The field density for the reclaimed mat on shoulders and all other roads shall be a minimum of 92%. The surface density, based on the 2 inch depth nuclear probe density, shall be a minimum of 97% of the nuclear probe density measured at 75% of the reclaimed mat depth.

The rollers for compacting the recycled material shall meet the requirements of Article 2001.05 of the Standard Specifications. The Contractor shall have, as a minimum, the following rollers for use: a sheepfoot roller, a double drum steel roller, and a 25 ton (22.5 Mg) or greater pneumatic tire roller. The steel drum roller may be used in the static or vibratory mode.

The Contractor shall perform initial rolling with a sheepfoot roller until the roller pads walk out of the reclaimed mix. Shaping, to achieve planned profile and cross slope, should cut deep enough to remove the sheepfoot roller marks.

Repeated reclaiming and rolling may be required within two calendar days after the initial mixing processing and rolling to achieve the target density on the completed in-place recycled surface. The Contractor shall discontinue any type of rolling that results in cracking, movement, or other types of distress until such time that the problem can be resolved. If there is a significant change in mix proportions, weather conditions, or other controlling factors, the Engineer may require construction of test strips to check target density.

01023.04 QUALITY CONTROL

The residual asphalt content shall be controlled within $\pm 0.5\%$ of the target established by the design.

The mineral stabilizing agent shall be controlled within $\pm 0.5\%$ of the target established by the design.

For foamed asphalt, the asphalt binder shall be maintained at a temperature within 10°F (5°C) above and 25°F (15°C) below $\pm 20^{\circ}\text{F}$ (10°C) of the optimum temperature established by the design. The Engineer may verify the foaming characteristics of each new tanker load, by measuring a sample from the equipment's test nozzle.

Unless otherwise specified in the contract documents, the crown of the compacted stabilized reclaimed mat shall be finished to within 0.5 inch (12.5 mm) 6 inches (150 mm) of the established centerline and grade reestablished by construction survey. The Contractor shall measure the profile along the center of each lane of the compacted reclaimed mat with a profilograph. Bumps and dips greater than 1 inch (25 mm) shall be corrected. The cross-slope of the compacted reclaimed mat shall be within 1 inch (25 mm) of the designated slope.

Unless otherwise specified in the contract documents, the Contractor shall perform seven nuclear gauge moisture and density tests per day's run every 500 feet (150 m) per lane at locations determined by the Engineer in accordance with Materials I.M. 504. The Quality Index for density will not apply. Sections of reclaimed mat that do not achieve minimum density criteria shall be remixed and compacted.

01023.05 METHOD OF MEASUREMENT.

A. Full Depth Reclamation.

The Engineer will compute the area of satisfactorily completed Full Depth Reclamation in square yards (square meters) from the measured longitudinal length of pavement reclaimed to the nearest 0.1 foot (0.1 meter) and the width of pavement specified in the contract documents.

B. Asphalt Stabilizing Agent.

The Engineer will measure the Asphalt Stabilizing Agent in tons (megagrams) or gallons (liters), through a calibrated pump used for metering the total delivery of the agent or by delivery tanker weight quantity.

C. Mineral Stabilizing Agent.

The Engineer will measure the other stabilizing agent in dry tons (megagrams) by delivery tanker quantity.

01023.06 BASIS OF PAYMENT.

A. Full Depth Reclamation.

The Contractor will be paid the contract unit price per square yard (square meter) for Full Depth Reclamation. This payment shall be full compensation for all labor, equipment, and materials necessary for preparation reclaiming, shaping, and compaction of the completed surface reclaimed material.

B. Asphalt Stabilizing Agent.

The Contractor will be paid the contract unit price per ton (megagram) or gallon (liter) for Asphalt Stabilizing Agent. This payment shall be full compensation for all labor, equipment, and materials necessary for furnishing the agent and application of the agent into the reclaimed material.

C. Mineral Stabilizing Agent.

The Contractor will be paid the contract unit price per dry ton (megagram) for mineral stabilizing agent. This payment shall be full compensation for all labor, equipment, and material necessary for furnishing the agent and application of the agent into the reclaimed material.